

NOTES ON SALPAS AND DOLIOLUMS OCCURRING ON THE PACIFIC COAST OF MIDDLE JAPAN*

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TWO PLATES and ONE FIGURE

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THALIACEA—CYCLOMYARIA—Doliolidae

1. *Doliolum (Dolioletta) tritonis* Herdman, 1888

Doliolum tritonis, Herdman, 1888; Traustedt, 1893; Borgert, 1894, 1896, 1901; Ritter, 1905; Neumann, 1906, 1913, 1935; Ihle, 1910.

2. *Doliolum (Dolioletta) nationalis* Borgert, 1893

Doliolum challengerii var., Traustedt, 1893.

Doliolum nationalis, Borgert, 1894, 1896, 1901; Neumann, 1906, 1913, 1935; Ihle, 1910.

3. *Doliolum (Dolioletta) denticulatum* Quoy et Gaimard, 1834

(*Doliolum ehrenbergi* Krohn; Gegenbaur, Ussow, Ritter, etc.)

Doliolum challengerii, Traustedt, 1893.

Doliolum denticulatum, Herdman, 1888; Borgert, 1894, 1896; Neumann, 1906, 1913, 1935; Ihle, 1910.

Occurrence: *D. denticulatum* and *D. nationalis* are common in the Japanese waters, being found almost throughout the year. *D. tritonis* occurs somewhat irregularly.

DESMOMYARIA—Salpidae

1. *Cyclosalpa pinnata* (Forskål), 1775

Salpa (Cyclosalpa) pinnata, Herdman, 1888; Brooks, 1893; Traustedt, 1893; Apstein, 1894, 1901, 1904, 1906 a-b; Streiff, 1908; Ihle, 1910, 1912; Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Cyclosalpa pinnata, Ihle, 1935; Ihle et Ihle-Landenberg, 1933 a, 1936 b.

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2. *Cyclosalpa pinnata* var. *polae* (Sigl), 1912

Salpa (*Cyclosalpa*) *polae*, Sigl, 1912.

Salpa (*Cyclosalpa*) *pinnata polae*, Ihle, 1912; Metcalf, 1918; Sewell, 1926; Komai, 1932.

Cyclosalpa pinnata polae, Ihle, 1935.

Cyclosalpa polae, Ihle et Ihle-Landenberg, 1936 b.

Aggregated form :

	<i>C. pinnata</i>	<i>C. pinnata</i> var. <i>polae</i>
Length	30-40 mm.	48-65 mm.
Peduncle	short and broad	very long, reaching beyond the end of the body when fully developed.
Luminous stripes	Two pairs are present; the anterior stripe extends from II to III while the posterior stripe extends from III to X and has the posterior end frequently hooked.	Two pairs are present as in <i>C. pinnata</i> ; sometimes the anterior and posterior stripes are continuous, forming a long stripe extending from II to X.
III and X	being apart from each other on the dorsal side.	approach, or are in contact with each other.
Termination of IV to X	at the place where the retractor muscle of Y joins X.	ventral to that of the retractor of Y to X.
Ciliated groove	simple and roughly U-shaped, with the two arms coming together.	describes a meandering course in various degrees, rosette-shaped as a whole.
Blind sac	long.	slightly smaller.
Anus	located on the level of the anterior margin of the peduncle.	situated on the level of the posterior margin of the peduncle.
Occurrence	in winter at Seto.	in winter at Seto and Misaki.

Remarks: Of previous authors, some consider the differences between this form and *C. pinnata* tabulated above, are of specific distinction, while others unite the two into one on account of the existence of intermediate forms. Some of the specimens before me (probably *C. polae greg.* described by Ihle et Ihle-Landenberg 1936) show the following features: 18-22 mm. in length. The peduncle varies in length considerably. Only one luminous stripe is present on each side between II and III. III and X are fused on the dorsal side. The ending point of IV to X is ventral to that of the retractor of Y to X. Y and some of the succeeding muscles are twisted as in the two preceding forms. The ciliated groove is U-shaped and simple. The blind sac is very small; the anus is situated on the level of the middle of the peduncle or more anteriorly.

In the living state, three individuals formed a wheel-like group. The luminous stripes, testis, and the surrounding regions of the oesophagus

and blind sac were coloured violet. They were kept alive for two days, but I found no luminescence of these individuals in the dark room.

Occurrence: In autumn and winter at Seto, and in summer at Susaki.

3. *Cyclosalpa affinis* (Chamisso), 1819

Salpa (*Cyclosalpa*) *chamissonis*, Brooks, 1893.

Salpa (*Cyclosalpa*) *affinis*, Traustedt, 1893; Apstein, 1894, 1906 a-b; Ritter, 1905; Ritter et Byxbee, 1905; Ihle, 1912; Oka, 1913; Metcalf, 1918; Sewell, 1926; Komai, 1932.

Cyclosalpa affinis, Ihle, 1935.

Occurrence: In winter at Seto and Misaki.

4. *Cyclosalpa komaii* Ihle et Ihle-Landenberg, 1936

(Pl. 13, Figs. 1 and 2).

Salpa (*Cyclosalpa*) *virgula*, Komai, 1932.

Cyclosalpa kamaii, Ihle et Ihle-Landenberg, 1936 a.

Aggregated form: In preserved materials several white spots formed by gathered blood corpuscles are found on the dorsal side. One of the ventral branches of IV (right branch in sinistral, left branch in dextral, individual) is elongated anteriorly into the ventral longitudinal muscle which reaches the base of the large attachment process. The other end of IV terminates freely beneath the longitudinal muscle.

The course of the alimentary canal differs in the dextral and sinistral individuals. It is the same as in *C. virgula* except some minute points. The testis is rounded, the vas deferens opens near the anus. The duct of the circum-intestinal gland opens into the small right* blind sac in the dextral individual and at the base of the large left blind sac in the sinistral individual.

Occurrence: A solitary form was found by Komai at Seto in spring 1930; the aggregated forms have been collected in winter 1930 and 1931 at Seto.

* According to Ihle et Ihle-Landenberg's terminology (1936). It is, however, quite possible that the large left blind sac of the dextral individual corresponds to the small blind sac of the sinistral individual, and the small right sac of the former to the large one of the latter. The alimentary canal shows different configurations in the dextral and sinistral individuals, as described by Komai (1932). The relative position of the intestine, vas deferens, and duct of the circum-intestinal gland is reversed in the two forms. The relation between these different arrangements may be understood easily by assuming a torsion of 180° at the region where the oesophagus opens to the stomach.

5. *Ritteriella picteti* (Apstein), 1904

Salpa picteti, Apstein, 1904, 1906 a-b.

Salpa amboinensis, Apstein, 1906 a-b.

Salpa (*Cyclosalpa*) *retracta*, Ritter, 1906; Oka, 1913.

Salpa picteti+*Salpa retracta*, Ihle, 1910, 1912.

Salpa (*Ritteria*) *picteti*+*Salpa* (*Ritteria*) *retracta*, Metcalf, 1918.

Salpa (*Ritteria*) *picteti*, Sewell, 1926.

Salpa (*Ritteriella*) *picteti*, Komai, 1932.

Ritteriella picteti, Ihle, 1935.

Occurrence: In winter at Seto, from the depths of 700 fathoms in Suruga Bay.

6. *Ritteriella amboinensis* (Apstein), 1904

Salpa amboinensis, Apstein, 1904; Ihle, 1910, 1912.

Salpa (*Ritteria*) *amboinensis*, Metcalf, 1918; Sewell, 1926.

Ritteriella amboinensis, Ihle et Ihle-Landenberg, 1933 a; Ihle, 1935.

A solitary form was obtained at Seto in winter 1933. 21 mm. in length. The atrial siphon has four notches as in *R. picteti*. The atrial sphincters are about ten. All the dorsal sphincters, except the first, are gathered to an atrial retractor, while some of the anterior sphincters of the ventral side end freely over this retractor muscle, and most of the succeeding sphincters are continuous to the dorsal side. The first dorsal sphincter continues ventrally into the first ventral sphincter, being held laterally between the retractor and its small branch; the second dorsal sphincter is twisted medio-dorsally; some distal sphincters of both sides are raised anteriorly on the median line. A fragmentary muscle is present in front of the end of the atrial retractor as in the preceding species.

7. *Ihlea asymmetrica* (Fowler), 1896

Salpa asymmetrica, Fowler, 1896; Apstein, 1901, 1906 a-b; Ihle, 1912.

Salpa (*Apsteinia*) *asymmetrica*, Metcalf, 1918.

Ihlea asymmetrica, Ihle, 1935.

One solitary and four aggregated forms of this rather rare species were collected at Seto in winter 1933 and in spring 1936. An aggregated form was found in February 1937 at Susaki.

Aggregated form: It is very strange that the figures given by previous authors do not show the arrangement of the body muscles correctly. For instance, V and VI are shown to be continuous along their whole length in Apstein's figure (1901), V is interrupted on the ventral side in Metcalf's figure (1918), and both V and VI are interrupted in Ihle's figure (1912). The longest oblique muscle found on

the ventral surface, extending from the two-fifths from the anterior end of the body to VI, is III according to Metcalf, whereas it is II in Ihle's figure. My specimens show that the body musculature resembles closely the figures given by Ihle (1912). The oral musculature is the same as in *Ihl. punctata* described by Streiff (1908).

8. *Salpa maxima* Forskål, 1775

Salpa africana-maxima, Herdman, 1888; Traustedt, 1893; Oka, 1913.

Salpa africana, Brooks, 1893.

Salpa maxima, Apstein, 1894, 1901, 1906 a-b; Streiff, 1908; Ihle, 1912, 1935; Ihle et Ihle-Landenberg, 1933 a; Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

This species is reported from the Japanese waters by Oka (1913), but I have seen no specimen of this species.

9. *Salpa fusiformis* Cuvier, 1804

Salpa runcinata-fusiformis, Herdman, 1888; Traustedt, 1893; Oka, 1913.

Salpa runcinata, Brooks, 1893.

Salpa fusiformis-runcinata, Ritter, 1905; Ritter et Byxbee, 1905.

Salpa fusiformis fusiformis, Ihle, 1912.

Salpa fusiformis, Apstein, 1894, 1901, 1906 a-b; Streiff, 1908; Ihle, 1910, 1935; Ihle et Ihle-Landenberg, 1932, 1933 a, 1936; Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Forma *aspera* (Chamisso), 1819

Salpa echinata, Herdman, 1888.

Salpa fusiformis, var. *echinata*, Apstein, 1894.

Salpa fusiformis forma *echinata*, Apstein, 1906 a-b; Ritter, 1905; Ritter et Byxbee, 1905; Ihle, 1910.

Salpa fusiformis aspera, Ihle, 1912.

Salpa fusiformis forma *aspera*, Metcalf, 1918; Sewell, 1926; Ihle, 1935.

Occurrence: *S. fusiformis* is the commonest species next to *Thal. democratica*. Forma *aspera* occurs in winter at Seto, in winter and autumn at Susaki, as well as in autumn and winter from the depths of 300-1000 m. in Suruga Bay.

10. *Salpa cylindrica* Cuvier, 1804

Salpa cylindrica, Herdman, 1888; Brooks, 1893; Traustedt, 1893; Apstein, 1894, 1906 a-b; Ritter, 1905; Ritter et Byxbee, 1905; Ihle, 1910, 1912, 1935; Oka, 1915; Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Occurrence: Several specimens were obtained at Inatori, Prov. Izu in August 1936.

11. *Iasis zonaria* (Pallas), 1774

Salpa cordiformis-zonaria, Herdman, 1888; Traustedt, 1893; Oka, 1913, 1915.

Salpa cordiformis, Brooks, 1893.

Salpa zonaria-cordiformis, Ritter, 1905; Ritter et Byxbee, 1905.

Salpa zonaria, Apstein, 1894, 1901, 1906 a-b; Streiff, 1908; Ihle, 1910, 1912.

Salpa (Iasis) zonaria, Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Iasis zonaria, Ihle, 1935; Ihle et Ihle-Landenberg, 1933 a.

Occurrence: In autumn and spring at Seto, in autumn and winter at Susaki, and in autumn at Misaki. In Suruga Bay some specimens were dredged from the depths of 150-300 hiro in winter 1936.

12. *Thetys vagina* (Tilesius), 1802

(Pl. 13, Fig. 3, Pl. 14, Fig. 1)

Salpa costata-tilesii, Herdman, 1888; Traustedt, 1893; Oka, 1913, 1915.

Salpa costata, Brooks, 1893.

Salpa tilesii, Apstein, 1894, 1901, 1906 a-b.

Salpa tilesii-costata, Ritter, 1905; Ritter et Byxbee, 1905.

Salpa vagina, Ihle, 1912.

Salpa (Thetys) vagina, Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Thetys vagina, Ihle, 1935.

Solitary form: The atrial sphincters are 11-13 on either side. The dorsal sphincters, excepting the first, are gathered into a retractor. The ventral sphincters end free. Second to fifth end beneath this retractor muscle, while the succeeding muscles terminate on the lateral side of the same. Usually v_2-v_5 , v_6-v_8 , and v_9-v_{10} are united at their ends, forming sometimes short incomplete retractors.

Embryo: The embryo is placed deep under a cover. It is connected with the placenta by a short umbrical cord which is penetrated by the continuation of the hypobranchial vessel of the embryo. The eleoblast is situated on the ventral side of the nucleus and elongate elliptical in shape. The remains of the eleoblast may be found in the adult as a white body on the ventral side of the nucleus. The tail-like protuberance is directed anteriorly. The second sphincter of the upper lip stretches throughout the dorsal side; the blood vessels running along this muscle and the intermediate muscle are fused at the angle of the mouth, and are divided ventrally into several branches. The body muscle is interrupted neither medio-dorsally nor dorso-laterally; three anterior muscles are in contact with one another on the dorso-median line, the following one or two muscles come near this group. The atrial sphincters are also uninterrupted. The stolon bud is present on the left side of the heart.

Judging from the structure of the nursing equipments and the persistence of their remains in old individuals, it is probable that the embryo is liberated by the mutilation of the umbrical tissue, the

placenta remaining with other nursing structures in the body of the mother. In many other species, the placenta is known to be separated together with the embryo from the body of the mother individual, and degenerates gradually in the testa of the embryo.

Aggregated form: The testa is thickened on the ventral side of the nucleus, and on the dorsal side of the embryo. The anterior portion of the body is somewhat flattened laterally on the ventral side; the testa is thickened on one side of this point than on the other, and marks the position where the stolon was attached in the younger stage.

The atrial musculature is enantiomorphic.* The siphon is notched on one side only (left side in the dextral, right side in the sinistral, individual). The atrial sphincters number 16 at most. All on the dorsal side are gathered to a retractor on the notched side; on the opposite side, only the anterior five muscles are united with the retractor, while the rest go directly to the ventral side. Each sphincter on the ventral side terminates freely on the lateral side beneath the retractor muscle, but irregular fusions occur frequently.

The nursing equipment is highly developed; it consists of a fan-shaped embryonal covering, a large placenta, and a knob-like basal portion. A comparatively large blood vessel runs along the lateral margin of the embryonal covering; this vessel divides into many branches running parallel to the distal margin, and forms a complex network between these parallel branches. A curious hook-like blood-forming knob projects into the placental hollow of the basal portion. The lateral column of this portion is provided with a number of transverse blood vessels on its surface. The main vessels on the same side of the nursing structures are united one another into a vessel of the mother individual.

Stolo-individual: The eleoblast is very large. The attachment points are nine, including the one (*S*) for the stolon. R_1 and R_2 are connected with R_3 and R_4 of the anterior individual of the same row; L_1 and L_2 are united with L_3 and L_4 of the individual of the opposite row situated obliquely forward.

Apstein (1894) describes aggregated forms which have nine processes on the body. Herdman (1888) reports a form (*Salpa* sp.?) resembling the aggregated form of this species, with four processes on

* Brooks (1893) described on the asymmetrical arrangement of the atrial sphincters as follows: "the branches of one lateral trunk are very slightly developed, while those from the other almost encircle the atrial funnel". This is nearly true on my Japanese specimens; but there are some differences between his descriptions and my findings.

each side. The processes described by these authors seem to be the attachment processes which correspond to the attachment points of the stolo-individual mentioned above, since the descriptions conform exactly with the attachment points both in number and in position. Besides these attachment points, many papillated tubercles are present on the dorsal side.

Many muscles interrupted in the adult are almost continuous in this stage. Of the oral musculature, u_3 is a continuous muscle, with the lateral end united with that of im , forming a sort of retractor which is divided ventrally into several branches. Two fragmentary muscles at the angle of the mouth of the adult are remains of this retractor; probably they function in union with u_3 . All body muscles are interrupted on the ventral side, but complete throughout on the dorsal side. I-III are in contact with one another medio-dorsally. Atrial sphincters are also continuous.

Occurrence: In winter and spring at Seto; in winter and summer at Susaki; and in spring and summer at Misaki.

13. *Thalia democratica* (Forskål), 1775 var. *orientalis*. n. var.

(Fig. 1, Pl. 14, Figs. 2 and 3)

Salpa democratica-mucronata, Herdman, 1888; Traustedt, 1893; Apstein, 1901; Ritter, 1905; Ritter et Byxbee, 1905; Oka, 1913.

Salpa mucronata, Apstein, 1894, 1906 a-b; Streiff, 1908; Ihle, 1910.

Salpa democratica, Ihle, 1912; Michael, 1917, 1918; Brooks, 1893.

Salpa (Thalia) democratica, Metcalf, 1918; Sewell, 1926; Stiasny, 1927.

Thalia democratica, Ihle, 1935; Ihle et Ihle-Landenberg, 1930, 1932, 1933 a.

Solitary form: The largest specimen in my collection is 10 mm. long, but most of the individuals are 6-8 mm. long excluding the posterior protuberance. The short lateral processes found in front of each posterior protuberance, are missing in many specimens—nearly 1/3 in the whole collection are lacking this process. An atrial palp is present on each side of the base of the atrial flap; the tip of the palp is bifurcated* in most of the specimens as shown in Fig. 1 B. The atrial palp ends in a pointed tip in the embryonic and young stages as well as in a few exceptional adults. The posterior and two nuclear protuberances vary in length, apparently independently from the body length. This feature seems, rather, to be characteristic of individuals

* Stiasny (1927) describes on the shape of the atrial palp of the European form as follows: "Beiderseits der Klappe springen 2 dünne steife Plättchen von Dreiecks-oder Rechteckform vor, getrennt von ihr durch tiefe Einschnitte." The European form seems to have a simpler atrial palp than the Japanese form.

of different swarms.

The posterior protuberance may be as long as the body, but may be only $1/4$ of the body length. The region surrounding the mouth, the atrial flap, atrial palp, and many protuberances on the body are usually papillated; in a few large individuals the whole body is papillated.

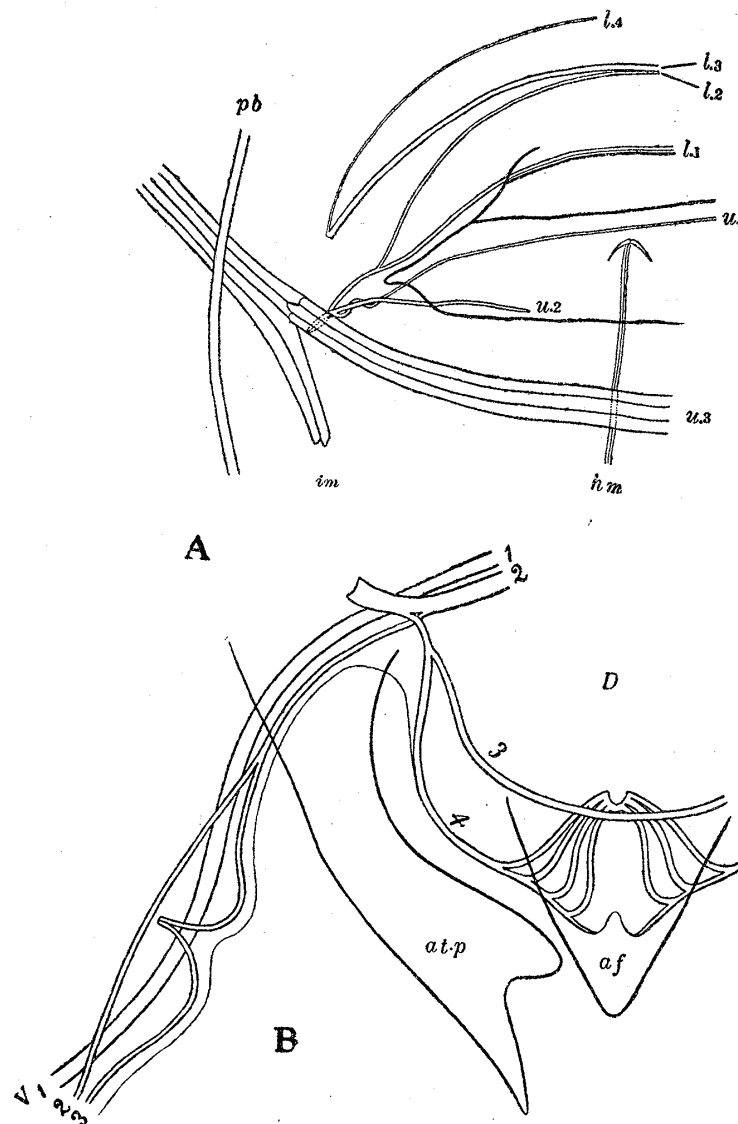


Fig. 1. *Thalia democratica* var. *orientalis*.

A—aggregated form, oral musculature from inside;
B—solitary form, atrial musculature from outside.

The oral musculature conforms well with descriptions given by Streiff (1908). The bands of body muscles are fused at each point of

union. The number of muscular bands of intermediate and body muscles varies considerably as shown below :

im.	5-10	max. 20	III	5-10	max. 20
I	5-10	20	IV	5-10	20
II	5-10	20	V	3-5	12

The atrial musculature is shown in Fig. 1 B. I could find in my Japanese specimens no asymmetrical arrangement of the atrial muscles described by Sewell (1926).

The endostyle ends posteriorly in most cases at II, or slightly behind it, but it may reach III in some cases.

Embryo: The dorsal ganglion is situated dorsally, behind the dorsal ends of the intermediate muscle as noticed already by Streiff (1908). The rudiments of the posterior and nuclear protuberances are distinct. The embryo is considered to become detached in its early stage and goes out from the atrial aperture of the mother individual. Among my materials, there is an aggregated form which contains a well developed embryo too large for the atrial opening of the mother. This observation shows clearly that the embryo becomes free in a later stage after the decay of the mother body at least in some cases.

Aggregated form: 5-8 mm. in length, but may reach 10 mm. The posterior end of the body is bluntly pointed. Eight protuberances of the mantle are present. Some of the protuberances, especially the posterior-most one, protrude outside the general surface of the testa. The number of these attachment protuberances is usually reduced in various degrees in adult individuals.

The oral musculature is as shown in Fig. 1 A. The number of the muscular bands of each body muscle is as follows :

I-5	II-3	III-3-4	IV-3	V-2
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The atrial musculature is enantiomorphic. In my material, the musculature resembles that in Metcalf's figure of the New-England coast form (1918).

The endostyle reaches slightly beyond the level of the end of the first body muscle in many cases. A pair of testes are present; each testis is divided into two simple lobes as noticed by Metcalf (1918) on the Philippine form, though there may be a few individuals with branched testes as in the European form. In stolo-individuals, the eleoblast is rather insignificant; Ussow's sensory tentacle is clearly seen on the lateral side of the body, just in front of the first body muscle.

Colouration and occurrence: The nucleus is usually coloured yellowish brown in both forms, though it may be bluish violet, more frequently in the aggregated form and rarely in the solitary form. In some wholly papillated specimens, the testa is faintly coloured yellowish.

This is the commonest species, found almost throughout the year at Seto, Susaki and Misaki.

Remarks: The Oriental form differs from the European form, as noticed already by Bomford (1913), Metcalf (1918), and Sewell (1926), especially in its smaller size, as may be seen in the following table showing the measurements of the body length of the specimens from various sources (in mm.):

Author		Form	Source
Apstein	25	sol.	in "Nordisches Plankton"
	12	sol.	in "Tiefsee-Exp. Report"
Bomford	11 (max.)	sol.	the Indian waters
Herdman	5-15	sol.	near Australia
	3-10	greg.	South Atlantic
Ihle	16	sol.	in "Tierreich"
	15	greg.	in "Tierreich"
Michael	8	sol.	San Diego region
Ritter	8	sol.	San Diego region
Stiasny	7-12	sol.	Java sea
Tokioka	6-8	sol.	the Japanese waters
	10 (max.)	sol.	the Japanese waters
	5-8	greg.	the Japanese waters
	10 (max.)	greg.	the Japanese waters
	9-10	sol.	Naples
	7	greg.	Naples

Furthermore, the Japanese form is characterized by the bifurcated atrial palp of the solitary form, and by the smooth appearance of the four-lobed testis of the aggregated form. The testis of the European form is also divided into four lobes, but some, at least, of the lobes are subdivided into many lobules.

Forma echinata. n. form.

(Pl. 14, Figs. 4 and 5)

This form differs from the type form only in the existence of several spiniferous ridges on the testa, the musculature and all body organs being perfectly identical. A few individuals were found at Seto and Susaki among the swarm of the type form of this species. Length less than 7.5 mm. in solitary form, 4-7 mm. in aggregated form.

Solitary form: Four longitudinal spiniferous ridges on each lateral side, a transverse ridge at the posterior end of the body, besides several ridges around the oral opening. The atrial palp is spinosed also along its axis.

Aggregated form: This form has been described by some previous authors. The body surface is divided into several parts by complex spinosed ridges which are arranged symmetrically in most cases. The posterior end of the body is elongated to various degrees, and this tail-like portion is frequently papillated. Usually the attachment protuberance is not well marked.

14. *Pegaea confoederata* (Forskål), 1775

Salpa scutigera confoederata, Herdman, 1888; Traustedt, 1893; Apstein, 1904; Oka, 1913, 1915.

Salpa scutigera, Brooks, 1893.

Salpa confoederata-scutigera, Ritter, 1905; Ritter et Byxbee, 1905.

Salpa confoederata, Apstein, 1894, 1906 a-b; Streiff, 1908; Ihle, 1910, 1912.

Salpa (Pegaea) confederata, Metcalf, 1918.

Salpa (Pegaea) confoederata, Sewell, 1926; Stiasny, 1927.

Pegaea confoederata, Ihle, 1935; Ihle et Ihle-Landenberg, 1932.

Occurrence: In spring at Tonda, Prov. Kii, in autumn at Susaki and Simoda.

15. *Traustedtia multitentaculata* (Quoy et Gaimard), 1826-1834

Salpa henseni, Traustedt, 1893; Apstein, 1894, 1904, 1906 a-b.

Salpa verrucosa, Apstein, 1894.

Salpa multitentaculata, Ihle, 1912.

Salpa (Traustedtia) multitentaculata + *Salpa (Traustedtia) multitentaculata bicristata* + *Salpa (Traustedtia) radiata*, Metcalf, 1918.

Salpa (Traustedtia) multitentaculata, Oka, 1921; Sewell, 1926.

Traustedtia multitentaculata, Ihle, 1935.

A solitary form, 23 mm. in length, was found by Oka in spring 1921 among a large swarm of *S. fusiformis* at Tateyama, Prov. Awa.*

* Nineteen specimens of the aggregated form of this rare species were obtained from the surface waters off Susaki in the end of July 1937. The details on this material are reserved for a future paper.

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PLATE 13

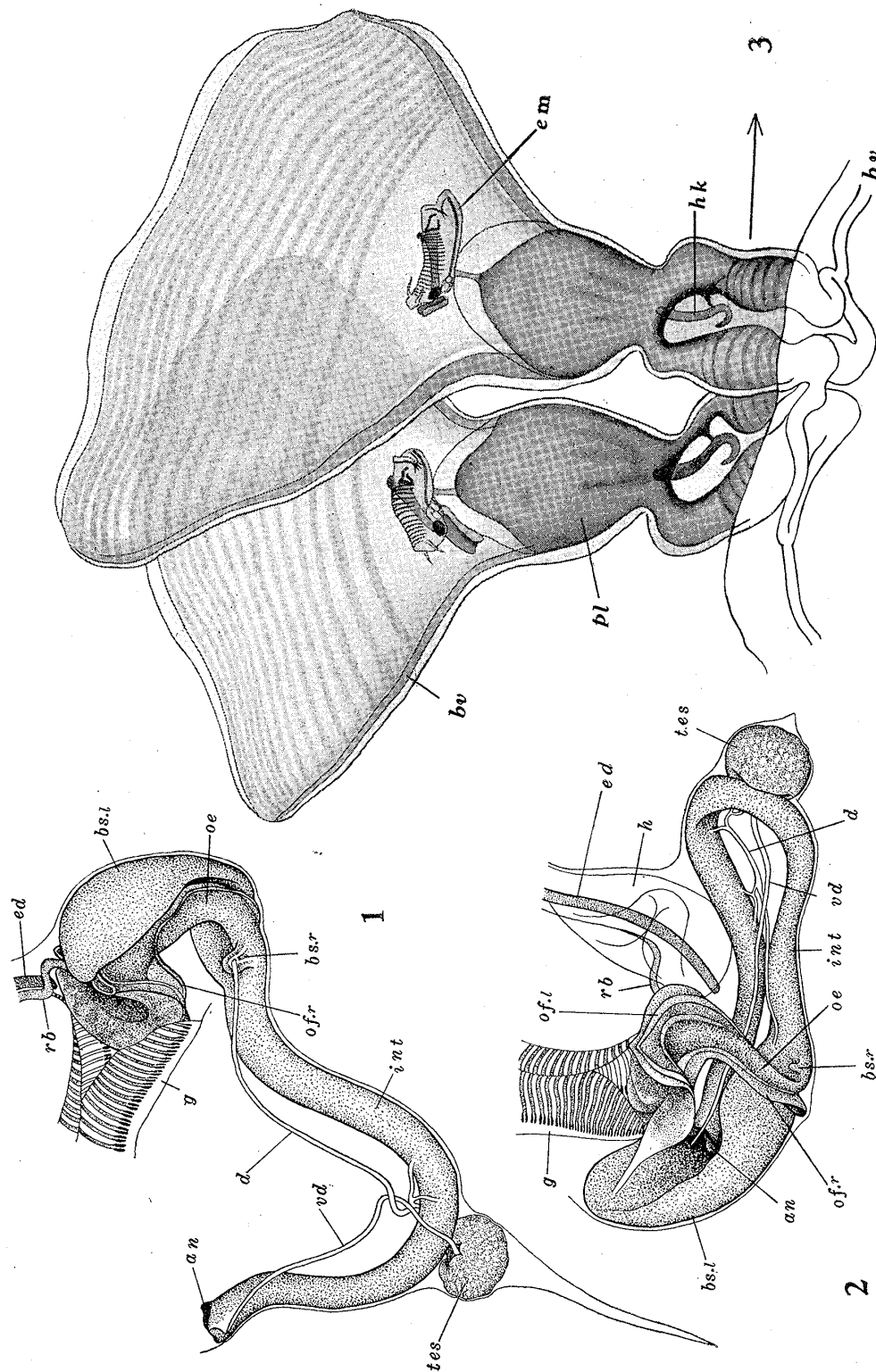
- Fig. 1—*Cyclosalpa komaii*, aggregated form, body organs of dextral individual, right side.
 2— " " , aggregated form, body organs of sinistral individual, right side.
 3—*Thetys vagina*, aggregated form, nursing structures of embryo.

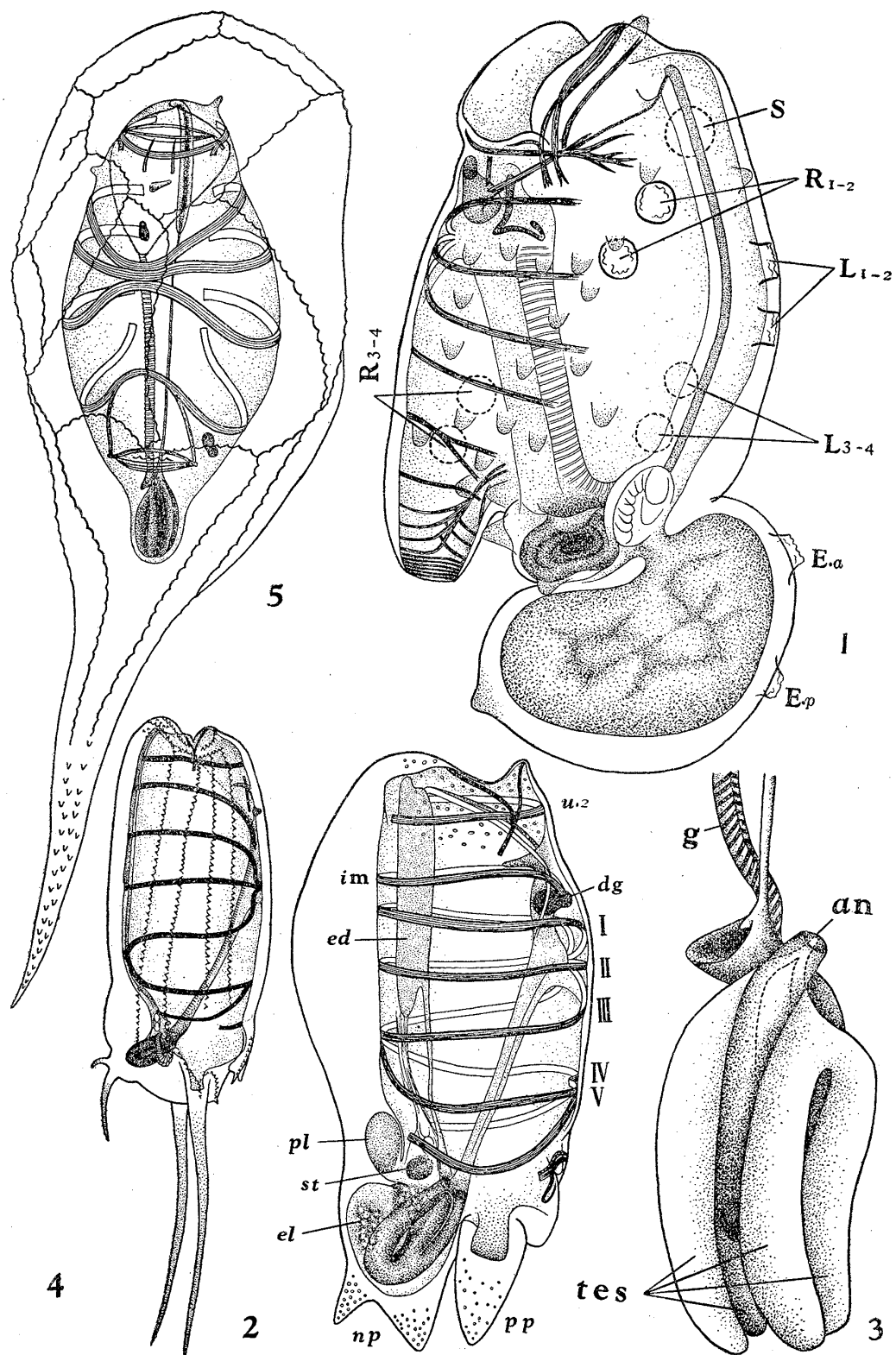
PLATE 14

- Fig. 1—*Thetys vagina*, aggregated form, dextral stolo-individual. $\times 24$.
 2—*Thalia democratica* var. *orientalis* n. var., solitary form, embryo. $\times 40$.
 3— " " " , aggregated form, testis. $\times 45$.
 4— " " " , forma *echinata* n.f., solitary form. $\times 7$.
 5— " " " " , aggregated form. $\times 20$.

ABBREVIATIONS

af	atrial flap.	np	nuclear protuberance.
an	anus.	oe	oesophagus.
at. p	atrial palp.	of	oesophageal fold, <i>l</i> left, <i>r</i> right.
bs	blind sac, <i>l</i> -left, <i>r</i> -right.	pb	peripharyngeal band.
bv	blood vessel.	pl	placenta.
D	dorsal side, D ₁₋₄ -dorsal sphincters of atrial siphon.	pp	posterior protuberance.
d	duct of circum-intestinal gland.	R ₁₋₄	attachment points.
dg	dorsal ganglion.	rb	retropharyngeal band.
E _{a, p}	attachment points on eleoblast.	S	attachment point of stolon.
ed	endostyle.	st	stolo.
el	eleoblast.	tes	testis.
em	embryo.	u ₁₋₃	dorsal sphincters of oral aperture.
g	gill.	V	ventral side, V ₁₋₁₀ -ventral sphincters of atrial siphon.
h	heart.	vd	vas deferens.
hk	hook-like blood-forming knob.	x	first atrial muscle.
hm	horizontal muscle.	y	second atrial muscle.
im	intermediate muscle.	I-VI	body muscles.
int	intestine.	l-4	atrial sphincters.
L ₁₋₄	attachment points.	←	arrow points anteriorly.
l ₁₋₄	ventral sphincters of oral aperture.		





T. TOKIOKA: NOTES ON SALPAS AND DOLIOLUMS